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COBOL COMPILER. VALIDATION SUMMARY REPORT. (U)

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TESTING
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VALIDATION
SUMMARY
REPORT



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Washington, D.C.
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⑯ 29 p.m.

⑯ COBOL COMPILER
VALIDATION SUMMARY REPORT

VALIDATION NUMBER CCVS74-VSR225

Prepared By:

FEDERAL COBOL COMPILER TESTING SERVICE
DEPARTMENT OF THE NAVY
WASHINGTON, D.C. 20376

D D C
Report No. 72
JUL 14 1977
Request B

408 438

CCVS74-VSR225

COBOL COMPILER VALIDATION

1. Validation Number	CCVS74-VSR225
2. Vendor	IBM Corporation
3. Mainframe	IBM 370/158
4. Compiler Identification	IBM OS/VS COBOL Release 2.0 PCD 0
5. Operating System Identification	MVS 3.7 VS2 with SUE
6. Compiler Validation System Version Number	CCVS74 2.0
7. Federal Information Processing Standard Publication	21-1

*PLEASE NOTE. The Federal COBOL Compiler Testing Service may make full and free public disclosure of the Validation Summary Report (VSR) in accordance with the "Freedom of Information Act" (5 U.S.C. #552). The results of this validation are only for the purpose of satisfying United States Government requirements, and apply only to the Computer System, Operating System release, and compiler version identified in the VSR. The COBOL Compiler Validation System is used to determine, insofar as is practical, the degree to which the subject compiler conforms to the Federal COBOL Standard. Thus, the VSR is necessarily discretionary and judgmental. The United States Government does not represent or warrant that the statements, or any one of them, set forth in the VSR are accurate or complete. The VSR is not meant to be used for the purpose of publicizing the findings summarized therein.

For information concerning this compiler you can contact the vendor's designated representative named below:

Jay Valentine
Federal Support Center
IBM Corporation
10401 Fernwood Road
Bethesda, Maryland 20034

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SECTION 1. INTRODUCTION

1.1 Purpose of the Validation Summary Report

The purpose of the Validation Summary Report (VSR) is to identify individual COBOL language elements whose implementation does not conform to American National Standard Programming Language COBOL, X3.23-1974, and to Federal Standard COBOL as adopted from the American National Standard by Federal Information Processing Standard 21-1 (FIPS PUB 21-1).

1.2 Preparation of the VSR

The Validation Summary Report is prepared by analyzing the results of running the COBOL Compiler Validation System (CCVS). The COBOL Compiler Validation System consists of audit routines containing features of Federal Standard COBOL, their related data, and an executive routine (VP-routine) which prepares the audit routines for compilation. Each audit routine is a COBOL program which includes many tests and supporting procedures indicating the result of the tests.

The testing of a compiler in a particular hardware/operating system environment is accomplished by compiling and executing each audit routine. The report produced by each routine tells whether the compiler passed or failed the tests in the routine. If the compiler rejects some language elements by terminating compilation, giving fatal diagnostic messages, or terminating execution abnormally, then the test containing the code the compiler was unable to process is deleted and the audit routine compilation and execution repeated.

The compilation listings and the output reports of the audit routines constitute the raw data from which the members of the Federal COBOL Compiler Testing Service produce a Validation Summary Report.

1.3 Organization of the VSR

The Validation Summary Report is made up of several sections the contents of which are described below.

a. Section 2 summarizes the results of the compilation and execution of the programs comprising the COBOL Compiler Validation System. Section 2 is subdivided into a subsection representing each level of each module defined in American National Standard Programming Language COBOL, X3.23-1974. Each subsection contains a list of all of the language elements which must be implemented in order to claim support of that level/module. The list of language elements will be annotated to include a description of both syntax and semantic errors detected during the validation.

b. Section 3 - FIPS PUB 21-1 defines four Federal Levels of the COBOL Standard. Section 3.1 of the VSR lists the discrepancies described in Section 2 by the Federal Level in which the problem occurs. Section 3.2 lists discrepan-

cies for the Report Writer Module, which is not a part of Federal Standard COBOL.

c. Section 4 contains information which describes the software environment in which the compiler was tested. This includes the name and version of the operating system; the implementor-names which were used in the Environment Division of the programs comprising the C CVS; the options used with the compiler; and if applicable, information regarding the use of compiler optimization features.

d. Section 5 contains the results of the ASCII validation. The purpose of these tests is to ascertain whether magnetic tapes written in ASCII code and with ANSI standard labels, and card decks with ASCII codes, can be transported between the system being validated and a foreign computer system.

e. Appendix A is the Validation Summary Working Document, a working paper resulting from the compilation and execution of the C CVS, and from which the VSR is derived.

1.4 Abstract Covering Compliance to ANS COBOL

Definition of an Implementation of American National Standard Programming Language COBOL (excerpts from X3.23-1974, Chapter 1, Section 1.5).

An implementation is defined to meet the requirements of the American National Standard COBOL specification if that implementation includes a fully implemented specified level of each of the functional processing modules and of the Nucleus as defined in this Standard. It follows from this that, in order to meet the requirements of this Standard, an implementation must:

a. Not require the inclusion of substitute or additional language elements in the source program, in order to accomplish any part of the function of any of the standard language elements.

b. Accept all standard language elements contained in a given level of a module which is specified as being included in the implementation, except as specifically exempted (as pertaining to specific hardware components for which support is not claimed). See "Elements that Pertain to Specific Hardware Components" below.

These points are of particular pertinence in two areas:

(1) There are throughout the American National Standard COBOL specification certain language elements whose syntax, or effect, is specified to be, in part, implementor-defined. While the implementor specifies the constraints on that portion of each element's syntax or rules that is indicated in this Standard to be implementor-defined, such constraints may not include any requirement for the inclusion in the source program of substitute or additional language elements.

(2) When a function is provided outside the source program that

accomplishes a function specified by any particular standard COBOL element, then the implementation must not require, except for Environment Division elements, the specification of that external function in place of or in addition to that standard language element:

The following qualifications apply to the American National Standard COBOL specification:

a. There are certain language elements which pertain to specific types of hardware components. In order for an implementation to meet the requirements of this standard, the implementor must specify the minimum hardware configuration required for that implementation and the hardware components that it supports. Further, when support is thus claimed for a specific hardware component, all standard language elements that pertain to that component must be implemented if the module in which they appear is included in the implementation. Language elements that pertain to specific hardware components for which support is not claimed, need not be implemented. However, the absence of such elements from an implementation of American National Standard COBOL must be specified.

b. An implementation of American National Standard COBOL may include the ENTER statement or not, at the option of the implementor.

c. An implementation that includes, in addition to a specified level of each of the functional processing modules and of the Nucleus, elements or functions that either are not defined in the American National Standard COBOL specification or are defined in a given level of a standard module not otherwise included in the implementation, meets the requirements of this Standard. This is true even though it may imply the extension of the list of reserved words by the implementor, and prevent proper compilation of some programs that meet the requirements of this Standard. The implementor must specify any optional language (language not defined in a specified level but defined elsewhere in the Standard) or extensions (language elements or functions not defined in this Standard) that are included in the implementation.

d. In general, the American National Standard COBOL specification specifies no upper limit on such things as the number of statements in a program, the number of operands permitted in certain statements, etc. It is recognized that these limits will vary from one implementation of American National Standard COBOL to another and may prevent the proper compilation of some programs that meet the requirements of this standard.

IMPLEMENTOR-DEFINED LANGUAGE SPECIFICATIONS

The language elements in the following lists depend on implementor definitions to complete the specification of the syntax or rules for the elements.

The elements whose syntax is partly implementor-defined are:

Element -----	Implementor-Defined Aspect -----
------------------	-------------------------------------

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SOURCE-COMPUTER paragraph	computer-name
OBJECT-COMPUTER paragraph	computer-name
MEMORY SIZE clause	integer
alphabet-name	implementor-name; whether implementor-names are provided.
SPECIAL-NAMES paragraph	implementor-name
ASSIGN clause	implementor-name
VALUE OF clause	implementor-name; whether implementor-names are provided.
RERUN clause	implementor-name and the form; the implementor provides at least one of seven specified forms.
CALL and CANCEL statements	relationship between operand and the referenced program.
COPY statement	relationship between library-name text-name, and the library.
ENTER statement	language-name
Margin R	The location.
Area B	The number of character positions.
Qualification	The number of qualifiers; at least five must be supported.

The elements whose effect is partly implementor-defined are:

Element	Implementor-Defined Aspect
-----	-----
alphabet-name	The correspondence between native and foreign character sets.
implementor-name switches	Whether setting can change during execution.
USAGE IS COMPUTATIONAL clause	Representation and whether automatic alignment occurs.
USAGE IS INDEX clause	Representation and whether automatic alignment occurs.

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SYNCHRONIZED clause	Whether implicit FILLER positions are generated; their effect on the size of group items and redefining items.
ACCEPT statement	Maximum size of one transfer of data in Level 1 Nucleus.
DISPLAY statement	Maximum size of one transfer of data in Level 1 Nucleus.
Numeric test	Representation of valid sign in the absence of the SIGN IS SEPARATE clause.
Comparison of nonnumeric items	Collating sequence, where NATIVE or implementor-name collating sequence is implicitly or explicitly specified.
Arithmetic expressions	Number of places carried for intermediate results.

Elements That Pertain to Specific Hardware Components

The standard language elements in the list that follows pertain to specific types of hardware components. These language elements must be implemented in an implementation of American National Standard COBOL when support is claimed, by the implementor, for the specific types of hardware components to which they pertain, and the module in which they are defined is included in that implementation.

Element	Hardware Component
CODE-SET clause	Device capable of supporting the specified code.
MULTIPLE FILE TAPE clause	Reel
CLOSE...REEL/UNIT statement	Reel or mass storage
CLOSE...NO REWIND statement	Reel or mass storage
OPEN...REVERSED statement	Reel with the capability of making records available in the reversed order; mass-storage with the capability of making records available in the reversed order.
OPEN...NO REWIND statement	Reel or mass storage
OPEN...I-O statement	Mass storage

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(Sequential I-O only)

OPEN EXTEND statement

Reel or mass storage

REWRITE statement

Mass storage

(Sequential I-O only)

SEND...BEFORE/AFTER
ADVANCING statement

Devices capable of vertical posi-
tioning; devices capable of action
based on mnemonic-names.

USE...I-O (Sequential
I-O only)

Mass storage

WRITE...BEFORE/AFTER
ADVANCING

Devices capable of vertical posi-
tioning; devices capable of action
based on mnemonic-name.

1.5 The Federal COBOL Standard

The COBOL compiler validation results enclosed in this document reflect the degree to which the subject COBOL compiler implements the Federal COBOL Standard. The Federal COBOL Standard is essentially the same as the American National Standard Programming Language COBOL, X3.23-1974, with two exceptions:

The Federal COBOL Standard defines 4 levels and the ANSI Standard defines only the minimum COBOL implementation and the full standard. Low and High levels of the Federal COBOL Standard (see 1.5.1) correspond to the above two ANSI levels (minus the Report Writer module). Two additional levels, low-intermediate and high-intermediate have been included in the Federal Standard between the highest and lowest subsets. These additional levels accommodate hardware which cannot support the full standard, but which is capable of implementing more than the minimum standard.

The Federal COBOL Standard states that the Report Writer Module is not mandatory in any Federal level, but that the specifications contained in X3.23-1974 should be used to the extent practical, consistent with requirements.

The Federal COBOL Standard requires that a compiler contain as a minimum the elements specified in at least one of the Federal levels. No restrictions are imposed on the inclusion of selected features from higher levels or even unique vendor extensions. Compatibility among various implementations of a given level containing additional features must be controlled by management imposed standards and restrictions.

1.5.1 Federal Standard COBOL Levels

a. Federal Standard COBOL specifications are the language specifications contained in American National Standard Programming Language COBOL, X3.23-1974. For purposes of the Federal Standard, the modules defined in X3.23-1974 are combined into four levels. Not all computers are large enough to accommodate a COBOL compiler containing the full ANSI Standard. Therefore, the Federal Government requires that all compilers acquired by its agencies contain as a minimum one of the four Federal levels, depending on machine size, configuration and user needs. The knowledge that all computers will support at least one of these four subsets simplifies the task of developing machine-independent COBOL programs.

b. The four levels of Federal Standard COBOL are identified as: Low, Low-Intermediate, High-Intermediate, and High. Each Federal Standard COBOL level is composed of either the high or low levels of the nucleus and ten of the eleven Functional Processing Modules (FPMs) defined in X3.23-1974. The four Federal Standard COBOL levels are reflected in the following table. The numbers in the table refer to the level within the FPM or nucleus as designated in X3.23-1974, and a dash in the table denotes that the corresponding FPM is omitted.

	Low Level	Low Inter- mediate Level	High Inter- mediate Level	High Level
NUCLEUS	1	1	2	2
FPMs				
TABLE HANDLING	1	1	2	2
SEQUENTIAL I-O	1	1	2	2
RELATIVE I-O	-	1	2	2
INDEXED I-O	-	-	-	2
SORT-MERGE	-	-	1	2
REPORT WRITER	-	-	-	-
SEGMENTATION	-	1	1	2
LIBRARY	-	1	1	2
DEBUG	-	1	2	2
INTER-PROGRAM COMMUNICATION	-	1	2	2
COMMUNICATION	-	-	2	2

1.5.2 Conformance to Federal Standard COBOL

A compiler implemented in conformance to Federal Standard COBOL must meet at least the following requirements.

- a. The implementation must include all of the language elements of at least one of the levels of Federal Standard COBOL.
- b. The implementation must meet all of the requirements defined in American National Standard COBOL, X3.23-1974, Section I, paragraph 1.5, Definition of An Implementation of American National Standard COBOL which is provided in section 1.4 of this VSR.
- c. The implementation must provide a facility for the user to optionally specify a level of Federal Standard COBOL for monitoring his source program at compile time. The monitoring will be an analysis of the syntax used in a source program against the syntax included in the specified level of Federal Standard COBOL. Any syntax used in the source program that does not conform to that allowed by the user selected level of Federal Standard COBOL will be

diagnosed. The syntax diagnosed as not conforming to the specified level will be identified to the user through a diagnostic message on the source program listing. The diagnostic message will contain, at least: (1) The identification of the source program line number in which the nonconforming syntax occurs, (2) the identification of the level of Federal Standard COBOL that supports the syntax or that the syntax is nonstandard COBOL.

1.6. Use of the VSR

The Federal COBOL Compiler Testing Service may make full and free public disclosure of the Validation Summary Report (VSR) in accordance with the "Freedom of Information Act" (5 U.S.C. #552). The results of the validation are only for the purpose of satisfying United States Government requirements, and apply only to the computer system, operating system release, and compiler version identified in the VSR.

The COBOL Compiler Validation System is used to determine, insofar as is practical, the degree to which the subject compiler conforms to the COBOL Standard. Thus, the VSR is necessarily discretionary and judgmental. The United States Government does not represent or warrant that the statements, or any one of them, set forth in the VSR are accurate or complete. The VSR is not meant to be used for the purpose of publicizing the findings summarized therein.

1.7 Sources of Additional Information

FIPS PUB 21-1 defines the Federal COBOL Language Standard. This publication is available from the Office of ADP Standards Management, National Bureau of Standards, Washington, D. C., 20234.

The detailed COBOL language specifications are given in the publication "American National Standard Programming Language COBOL, X3.23-1974", available from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

An explanation of the COBOL Compiler Validation System is contained in the CCVS User's Guide. This document explains how to run the compiler validation system. The User's Guide and a magnetic tape containing a copy of the CCVS programs are available from the National Technical Information Service, Springfield, Virginia, 22151. (Ordering information can be obtained from the Federal COBOL Compiler Testing Service.)

1.8. Requests for Interpretation

Questions regarding this VSR or the CCVS in general should be forwarded to the FCCTS. If any problem cannot be adequately resolved through the FCCTS, the request for interpretation will be forwarded to the Federal COBOL Interpretation Committee for final resolution.

A brochure describing the validation process including the procedures for requesting a validation and resolution of questions involving interpretation of the current Federal Standard is available from the Department of the Navy.

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Federal COBOL Compiler Testing Service, Washington, D.C. 20376.

1.9 Modules and Language Elements Excluded from Testing

During an official validation, certain C CVS tests may not be used, and certain facilities provided by the subject compiler may not be tested.

1.9.1 Federal Standard COBOL Approved Interpretations

The National Bureau of Standards published in the Federal Register Vol. 41 No. 179, September 14, 1976, an approved interpretation of Federal Standard COBOL as pertains to the evaluation of arithmetic expressions in the COMPUTE statements. This interpretation states that "size of the intermediate result field is implementor-defined."

Since the results of evaluating arithmetic expressions are not predictable, all COMPUTE statements and IF statements containing arithmetic expressions have been removed from the COBOL Compiler Validation System.

1.9.2 Report Writer Module

FIPS PUB 21-1 excludes the Report Writer Module from the Federal COBOL Standard. However, the Report Writer Module is still tested during a validation if support for that module is claimed by the compiler vendor.

1.9.3 Communication Module

Although it is part of Federal Standard COBOL as defined by FIPS FUP 21-1, the Communication Module is not currently tested in the course of an official validation for two specific reasons. First, a large volume of requests for interpretation on this module have been submitted to the cognizant ANSI committee (X3J4) for resolution. Secondly, facilities for testing were insufficient to determine the validity of the Communication Module test programs during the development of C CVS74.

1.9.4 Vendor Omissions or Extensions

Language elements are not tested which have been legitimately omitted from the implementation by the implementor (refer to 1.4). Additionally, no implementor extensions to the standard COBOL language are tested in any way.

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1.10 Timeliness of the Validation Summary Reports

The timeliness of the Validation Summary Report is important. Compilers and their related operating system software are modified several times a year. The Compiler Validation System used to validate compilers is also updated during the life of the system. Therefore to ensure that the latest version of both the vendor's compiler and the Validation System are the latest officially released versions, check with the:

Director
Federal COBOL Compiler Testing Service
Department of the Navy
Washington, D. C. 20376
(202) 697-1247

Please use the Validation Summary Report number of this report when corresponding with the Testing Service.

SECTION 2. DETAILED EVALUATION OF ERRORS.

This section summarizes the results of the compilation and execution of the programs comprising the COBOL Compiler Validation System (CCVS). The version of the C CVS used during this validation is shown inside the front cover of the VSR.

Section 2 is made up of a variable number of subsections. The number of subsections is dependent on the Level of Federal COBOL being validated. There will be a subsection for each level of each module which is validated. If the high level of a module is validated then there will be two subsections for that module; one for the low level and one for the high level.

A validation of the low level of Federal Standard COBOL would result in three subsections being present. One for Nucleus Level 1, one for Sequential I-O Level 1, and one for Table Handling level 1.

Each error or deviation noted in this section makes reference to a program or functional COBOL module contained in Appendix A (Validation Summary Working Document). This reference provides the documented results of an occurrence of errors/deviations detected during the running of the C CVS using the compiler within the environment identified within this document. The Validation Summary Working Document is presented in sequence by functional module, functional module level and program number as defined below.

Each program in the COBOL Compiler Validation System is identified by a 5-character program name. The name associates the routine with the functional processing module and level of American National Standard Programming Language COBOL tested within the program.

The five character name has the general format XXNMM. The first two characters are alphabetic and identify the functional module tested by the program. The permissible values are:

NC - Nucleus
TH - Table Handling
SG - Sequential I-O
RL - Relative I-O
IX - Indexed I-O
ST - Sort-Merge
RW - Report Writer
SG - Segmentation
LB - Library
DB - Debug
IC - Inter-Program Communication
CM - Communication

The third character of the audit routine name is either a 1 or 2, and identifies the level of the functional module being tested. Each module and level is represented by several programs. The fourth and fifth characters of the program name are sequence numbers for programs which test features in the

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same level of the same functional processing module.

As an example, the program name NC210 is the tenth program in the series of routines which test the second level of the Nucleus module.

Description of Section 2.

Each error/deviation is noted by number in the left hand margin opposite the language element in question. This number is used in section 3 to categorize errors by Federal level (See 1.5.1). Inserted directly below the language element is a brief description of the error. To the right of the language element is a page reference to x3.23-1974, American National Standard Programming Language COBOL. The reference at the end of the description of the error is to Appendix A which contains the detailed information collected during the validation. The reference is made up of the routine name followed by an A or B (A for compile time or syntax error and B for execution time or semantic error) and a number which makes the error unique in Appendix A.

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Example:

2.1 Nucleus Level 1

Operational symbols: S V F IL-21

2.1.9 * The scaling character 'F' is not permitted in a
* PICTURE character-string.
* (NC101.A.2)

2.2 Sequential I-O Level 1

2.1.9 represents the ninth error for Nucleus Level 1

II-21 represents the page in x3.23-1974 where the language element is defined

* Boxes the description of the error/deviation

NC101-A-2 represents:

Program name - NC101
Syntax error - A
second error - 2

2.1 NUCLEUS LEVEL 1

Language Concepts	I-75
Characters used for words	I-76
0, 1, . . . , 9	
A, B, . . . , Z	
- (hyphen or minus)	
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" quotation mark	
(left parenthesis	
) right parenthesis	
. period	
space	
= equal sign	
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+ plus	
- minus	
CR credit	
DE debit	
Z zero suppress	
* check protect	
\$ currency sign	
, comma	
. period	
/ stroke	
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* Continuation of the section header WORKING-STORAGE was not * accepted.	
	(NC113.A)

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implementor-name IS mnemonic-name series	
ON STATUS	

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.	
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* The VALUE clause containing an alphanumeric literal for an	
* alphanumeric-edited data item was not accepted.	
* (ASVP9.A)	

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Overlapping operands	II-51
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The ADD statement	II-55
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TC identifier	
2.1.3 -----	
* The move of a group item to an alphanumeric-edited data item	
* did not produce the expected result.	
* -----	(NC105 E.1)
GIVING identifier	
ROUNDED phrase	
SIZE ERROR phrase	
The ALTER statement (only one procedure-name) . .	II-57
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The DIVIDE statement	II-61
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ROUNDED phrase	
SIZE ERROR phrase	
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The IF statement (statements must be imperative)	II-66
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ALL	
LEADING	
CHARACTERS	
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TIMES phrase	
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RUN	
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FROM identifier	
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ROUNDED phrase	
SIZE ERROR phrase	

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2.2 NUCLEUS LEVEL 2

All elements of 1 NUC 1,2 are a part of 2 NUC 1,2

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The SPECIAL-NAMES paragraph.	II-8
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data-name THRU data-name	
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The STRING statement	II-86
DELIMITED series	
POINTER phrase	
ON OVERFLOW phrase	
The SUBTRACT statement	II-89
FROM identifier series	
GIVING identifier series	
2.2.3 -----	
* A data item containing an edited picture character-string which	
* was the subject of the GIVING phrase did not produce the expected	
* result.	
	(NC213.B)

CORRESPONDING phrase	
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2.3 TABLE HANDLING LEVEL 1

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2.4 TABLE HANDLING LEVEL 2

ALL elements of 1 TBL 1,2 are a part of 2 TBL 1,2

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Procedure Division
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AT END phrase
WHEN phrase
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AT END phrase
WHEN phrase

2.5 SEQUENTIAL I-O LEVEL 1

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User-defined words	I-76
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record-name	
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Environment Division	
The FILE-CONTROL paragraph	IV-4
The file control entry	IV-4
SELECT clause	
ASSIGN TO implementor-name clause	
ORGANIZATION IS SEQUENTIAL clause	
ACCESS MODE IS SEQUENTIAL clause	
FILE STATUS clause	
The I-O-CONTROL paragraph.	IV-6
RERUN clause	
SAME AREA clause	
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The BLOCK CONTAINS clause.	IV-11
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integer RECORDS	
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STANDARD	
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The VALUE OF clause.	IV-19
implementor-name IS literal	
implementor-name IS literal series	
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The OPEN statement (only a single file-name may appear in an OPEN statement).	IV-24
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INTO identifier AT END phrase	
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EXCEPTION/ERROR PROCEDURE	
ON file-name	
ON INPUT	
ON OUTPUT	
ON I-O	
The WRITE statement	IV-34
FROM identifier	
BEFORE/AFTER integer LINES	
BEFORE/AFTER PAGE	

2.6 SEQUENTIAL I-O LEVEL 2

ALL elements of 1 SEQ 1,2 are a part of 2 SEQ 1,2

Language Concepts	
Special register	I-80
LINAGE-COUNTER.	IV-3
Environment Division	
The FILE-CONTROL paragraph	IV-4
The file control entry	IV-4
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OPTIONAL phrase	
RESERVE integer AREA(S) clause	
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SAME RECORD AREA clause	
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MULTIPLE FILE TAPE clause	
Data Division	
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The BLOCK CONTAINS clause	IV-11
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The LINAGE clause	IV-15
FOOTING phrase	
TOP phrase	
BOTTOM phrase	
The VALUE OF clause	IV-19
implementor-name IS data-name	
implementor-name IS data-name series	
Procedure Division	
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NO REWIND, REMOVAL, or LOCK	
file-name series	
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REVERSED	
NO PEWIND	
OUTPUT	
NO REWIND	
EXTEND	
file-name series	
INPUT, OUTPUT, I-O, and EXTEND series	
The USE statement	IV-32
EXCEPTION/ERROR PROCEDURE ON file-name series	
EXCEPTION/ERROR PROCEDURE ON EXTEND	
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BEFORE/AFTER identifier LINES	
BEFORE/AFTER mnemonic-name	
AT END-OF-PAGE imperative-statement	

2.7 RELATIVE I-O LEVEL 1

Language Concepts	
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record-name	
I-O status.	V-2
Environment Division	
The FILE-CONTROL paragraph.	V-5
The file control entry.	V-5
SELECT clause	
ASSIGN TO implementor-name clause	
ORGANIZATION IS RELATIVE clause	
ACCESS MODE clause	
SEQUENTIAL	
RANDOM	
FILE STATUS clause	
The I-O-CONTROL paragraph	V-7
RERUN clause	
SAME AREA clause	
SAME AREA series	
Data Division	
File Section.	V-10
The file description entry.	V-11
The record description entry.	V-10
The BLOCK CONTAINS clause	V-12
integer CHARACTERS	
integer RECORDS	
The DATA RECORDS clause	V-13
data-name	
data-name series	
The LABEL RECORDS clause.	V-14
STANDARD	
OMITTED	
The RECORD CONTAINS clause.	V-15
integer-1 TO integer-2 CHARACTERS	
The VALUE OF clause	V-16
implementor-name IS literal	
implementor-name IS literal series	
Procedure Division	
The CLOSE statement	V-17
WITH LOCK	
file-name series	
The DELETE statement.	V-19
INVALID KEY phrase	
The OPEN statement.	V-20
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OUTPUT	
I-O	

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file-name series	
INPUT, OUTPUT, and I-O series	
The READ statement.	V-23
INTO identifier	
AT END phrase	
INVALID KEY phrase	
The REWRITE statement	V-26
FROM identifier	
INVALID KEY phrase	
The USE statement	V-30
EXCEPTION/ERROR PROCEDURE	
ON file-name	
ON INPUT	
ON OUTPUT	
ON I-O	
The WRITE statement.	V-32
FROM identifier	
INVALID KEY phrase	

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2.8 RELATIVE I-O LEVEL 2

ALL elements of 1 REL 0,2 are a part of 2 REL 0,2

Environment Division

The FILE-CONTROL paragraph	V-5
The file control entry.	V-5
SELECT clause	
RESERVE integer AREA(S) clause	
ACCESS MODE IS DYNAMIC clause	
The I-O-CONTROL paragraph	V-7
SAME RECORD AREA	
SAME RECORD AREA entries	

Data Division

The file description entry.	V-11
The BLOCK CONTAINS clause	V-12
integer-1 TO integer-2 RECORDS	
integer-1 TO integer-2 CHARACTERS	
The VALUE OF clause	V-16
implementor-name IS data-name	
implementor-name IS data-name entries	

Procedure Division

The READ statement.	V-23
NEXT RECORD	
The START statement	V-28
KEY IS phrase	
INVALID KEY phrase	
The USE statement	V-30
EXCEPTION/ERROR PROCEDURE	
ON file-name series	

2.9 INDEXED I-O LEVEL 1

Language Concepts	
User-defined words.	I-76
file-name	
record-name	
I-O status.	VI-2
Environment Division	
The FILE-CONTROL paragraph.	VI-5
The file control entry.	VI-5
SELECT clause	
ASSIGN TO implementor-name clause	
ORGANIZATION IS INDEXED clause	
ACCESS MODE clause	
SEQUENTIAL	
RANDOM	
RECORD KEY clause	
FILE STATUS clause	
The I-O-CONTROL paragraph	VI-8
RERUN clause	
SAME AREA clause	
SAME AREA series	
Data Division	
File Section.	VI-11
The file description entry.	VI-12
The record description entry.	VI-11
The BLOCK CONTAINS clause	VI-13
integer CHARACTERS	
integer RECORDS	
The DATA RECORDS clause	VI-14
data-name	
data-name series	
The LABEL RECORDS clause.	VI-15
STANDARD	
OMITTED	
The RECORD CONTAINS clause.	VI-16
integer-1 TO integer-2 CHARACTERS	
The VALUE OF clause	VI-17
implementor-name IS literal	
implementor-name IS literal series	
Procedure Division	
The CLOSE statement	VI-18
WITH LOCK	
file-name series	
The DELETE statement.	VI-20
INVALID KEY phrase	
The OPEN statement.	VI-21

2.9.1 -----
 * It appears that improper execution of the OPEN statement

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* may have invalidated all accesses made to the file by the
* READ and WRITE statements.
*

INPUT	
OUTPUT	
I-O	
file-name series	
INPUT, OUTPUT, and I-O series	
The READ statement.	VI-24
INTO identifier	
AT END phrase	
INVALID KEY phrase	
The REWRITE statement	VI-28
FROM identifier	
INVALID KEY phrase	
The USE statement	VI-32
EXCEPTION/ERROR PROCEDURE	
ON file-name	
ON INPUT	
ON OUTPUT	
ON I-O	
The WRITE statement	VI-33
FROM identifier	
INVALID KEY phrase	

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2.10 INDEXED I-O LEVEL 2

ALL ELEMENTS OF 1 INX 0,2 ARE A PART OF 2 INX 0,2

Environment Division

The FILE-CONTROL paragraph	VI-5
The file control entry	VI-5
SELECT clause	
RESERVE integer AREA(S) clause	
ACCESS MODE IS DYNAMIC clause	
ALTERNATE RECORD KEY clause	
WITH DUPLICATES phrase	
The I-O-CONTROL paragraph.	VI-8
SAME RECORD clause	
SAME RECORD AREA series	

Data Division

The file description entry	VI-12
The BLOCK CONTAINS clause.	VI-13
integer-1 TO integer-2 RECORDS	
integer-1 TO integer-2 CHARACTERS	
The VALUE OF clause.	VI-17
implementor-name IS data-name	
implementor-name IS data-name series	

Procedure Division

The READ statement	VI-24
KEY IS phrase	
NEXT RECORD	
The START statement.	VI-30
KEY IS phrase	
INVALID KEY phrase	
The USE statement.	VI-32
EXCEPTION/ERROR PROCEDURE	
ON file-name series	

2.11 SORT-MERGE LEVEL 1

Language Concepts	
User-defined words.	I-76
file-name	
Environment Division	
The FILE-CONTROL paragraph.	VII-2
The file control entry.	VII-2
SELECT clause	
ASSIGN TO implementor-name clause	
Data Division	
File Section.	VII-5
The sort-merge file description entry	VII-5
The DATA RECORDS clause	VII-6
The RECORD CONTAINS clause.	VII-7
Procedure Division	
The RELEASE statement	VII-12
FROM phrase	
The RETURN statement.	VII-13
INTO phrase	
AT END phrase	
The SORT statement (only one SORT statement, a STOP RUN statement, and any associated input-output procedures allowed in the nondeclarative portion of a program)	VII-14
KEY data-name	
data-name series	
ASCENDING series	
DESCENDING series	
mixed ASCENDING/DESCENDING	
INPUT PROCEDURE phrase	
THRU	
USING phrase	
OUTPUT PROCEDURE phrase	
THRU	
GIVING phrase	

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2.12 SORT-MERGE LEVEL 2

ALL elements of 1 SRT 0,2 are a part of 2 SRT 0,2

Environment Division

The FILE-CONTROL paragraph. VII-2
The file control entry. VII-2
 SELECT clause
The I-O-CONTROL paragraph VII-3
 SAME RECORD AREA clause
 SAME SORT/SORT-MERGE AREA clause
 SAME series

Procedure Division

The MERGE statement VII-8
 KEY data-name
 data-name series
 ASCENDING series
 DESCENDING series
 mixed ASCENDING/DESCENDING
 COLLATING SEQUENCE phrase
 USING phrase
 OUTPUT PROCEDURE phrase
 THRU
 GIVING phrase
The SCRT statement (multiple SORT statements are
 permitted). VII-14
 COLLATING SEQUENCE phrase

2.13 REPORT WRITER LEVEL 1

2.13.1 -----

*
 * The Report Writer Module was not run during the validation.
 *

Language Concept	
User-defined words	I-76
file-name	
report-name	
Special registers	I-80
LINE-COUNTER	VIII-1
PAGE-COUNTER	VIII-1
Data Division	
Report Section	VIII-2
The file description entry	VIII-3
The report description entry	VIII-4
The report group description entry	VIII-6
The BLOCK CONTAINS clause	VIII-24
The CODE clause	VIII-25
The CODE-SET clause	VIII-26
The COLUMN NUMBER clause	VIII-27
The CONTROL clause	VIII-28
data-name	
data-name series	
FINAL	
FINAL data-name series	
The data-name clause	VIII-30
The GROUP INDICATE clause	VIII-31
The LABEL-RECORDS clause	VIII-32
The LINE NUMBER clause	VIII-33
integer	
NEXT PAGE	
PLUS integer	
The NEXT GROUP clause	VIII-35
integer	
PLUS integer	
NEXT PAGE	
The PAGE clause	VIII-36
integer LINES	
HEADING	
FIRST DETAIL	
LAST DETAIL	
FOOTING	
The PICTURE clause	II-18
The RECORD CONTAINS clause	VIII-39
The REPORT clause	VIII-40
report-name series	
The SOURCE clause	VIII-41

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The SUM clause	VIII-42
UPON data-name series	
RESET phrase	
The TYPE clause	VIII-45
REPORT HEADING (RH)	
PAGE HEADING (PH)	
CONTROL HEADING (CH)	
DETAIL (DE)	
CONTROL FOOTING (CF)	
PAGE FOOTING (PF)	
REPORT FOOTING (RF)	
The VALUE IS clause	II-36
The VALUE OF clause	VIII-50
Procedure Division	
The GENERATE statement	VIII-51
report-name	
data-name	
The INITIATE statement	VIII-53
report-name	
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report-name	
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report-name series	
The USE statement	VIII-56
BEFORE REPORTING	

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2.14 SEGMENTATION LEVEL 1

Language Concepts	
User-defined words	I-76
segment-number	
Procedure Division	
Segment-numbers	IX-4
Fixed segment-number range 0 through 49	
Non-fixed segment-number range 50 through 99	
All sections with the same segment-number must	
be together in the source program	

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2.15 SEGMENTATION LEVEL 2

ALL elements of 1 SEG 0/2 are a part of 2 SEG 0/2

Environment Division
The OBJECT-COMPUTER paragraph
SEGMENT-LIMIT. IX-5

Procedure Division
Segment-numbers IX-4
Sections with the same segment-number need not
be physically contiguous in the source program

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2.16 LIBRARY LEVEL 1

Language Concepts	I-76
User-defined words	I-76
text-name	
ALL divisions	X-2
The COPY statement	X-2

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2.17 LIBRARY LEVEL 2

All elements of 1 LIB 0,2 are a part of 2 LIB 0,2

ALL divisions
The COPY statement
OF library-name
REPLACING phrase

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2.18 DEBUG LEVEL 1

Language Concepts	
Special registers.	I-80
DEBUG-ITEM.	XI-1
Environment Division	
The SOURCE-COMPUTER paragraph	
WITH DEBUGGING MODE clause.	XI-3
Procedure Division	
USE FOR DEBUGGING statement.	XI-4
procedure-name	
procedure-name series	
ALL PROCEDURES	
Debugging lines.	XI-10

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2.19 DEBUG LEVEL 2

ALL elements of 1 DEB 0,2 are a part of 2 DEB 0,2

Procedure Division

USE FOR DEBUGGING statement. XI-4
ALL REFERENCES OF identifier series
file-name series
cd-name series

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2.20 INTER-PROGRAM COMMUNICATIONS LEVEL 1

Data Division	
Linkage Section.	XII-2
Procedure Division	.
Procedure Division header.	XII-4
USING phrase	
The CALL statement	XII-5
literal	
USING data-name series	
The EXIT PROGRAM statement	XII-8

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2.21 INTER-PROGRAM COMMUNICATIONS LEVEL 2

ALL elements of 1 IPC 0,2 are a part of 2 IPC 0,2

Procedure Division	
The CALL statement.	XII-5
identifier	
ON OVERFLOW phrase	
The CANCEL statement.	XII-7

2.22 COMMUNICATION LEVEL 1

* The COMMUNICATION Module is not currently evaluated as part of an official validation. See Section 1.9.3.	
<hr/>	
Language Concepts	
User-defined words.	I-76
cd-name	
<hr/>	
Data Division	
Communication Section	XIII-2
The communication description entry	XIII-3
FOR INPUT clause	
END KEY	
MESSAGE COUNT	
MESSAGE DATE	
MESSAGE TIME	
SYMBOLIC QUEUE	
SYMBOLIC SOURCE	
SYMBOLIC SUB-QUEUE-N	
STATUS KEY	
TEXT LENGTH	
FOR OUTPUT clause	
DESTINATION COUNT	
DESTINATION TABLE	
INDEXED BY	
ERROR KEY	
SYMBOLIC DESTINATION	
STATUS KEY	
TEXT LENGTH	
<hr/>	
Procedure Division	
The ACCEPT MESSAGE COUNT statement.	XIII-12
The DISABLE statement	XIII-13
INPUT	
OUTPUT	
KEY identifier/literal	
The ENABLE statement.	XIII-15
INPUT	
OUTPUT	
KEY identifier/literal	
The RECEIVE statement	XIII-17
MESSAGE	
INTO identifier	
NO DATA phrase	
The SEND statement.	XIII-20
FROM identifier-1 WITH	
WITH EMI	
WITH EGI	
BEFORE/AFTER ADVANCING	

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identifier-3 LINES
integer LINES
mnemonic-name
PAGE

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2.23 COMMUNICATION LEVEL 2

* The COMMUNICATION Module is not currently evaluated as
* part of an official validation. See Section 1.9.3.

ALL elements of 1 COM 0,2 are a part of 2 COM 0,2

Communication Section

The communication description entry. XIII-3
FOR INPUT
INITIAL

Procedure Division

The DISABLE statement. XIII-13
INPUT
TERMINAL
The ENABLE statement XIII-15
INPUT
TERMINAL
The RECEIVE statement. XIII-17
SEGMENT
The SEND statement XIII-20
FROM identifier-1
WITH identifier-2
WITH ESI

SECTION 3. COMPILER STATUS

3.1 Federal Standard COBOL

Section 1.5 explains the four levels of Federal Standard COBOL and their relation to American National Standard COBOL. This section lists the discrepancies described in Section 2 by the Federal level in which the problem occurs. All errors listed for a lower level are also errors in any higher levels even though they are listed only in the lower level. The paragraph number from Section 2 is used to reference the errors in each federal level.

3.1.1 Low Level

- 2.1.1 Line continuation of the word WORKING-STORAGE was not accepted.
- 2.1.2 VALUE clause not accepted on an alphanumeric-edited data item.
- 2.1.3 The move of a group item to an edited item gave incorrect results.

3.1.2 Low-Intermediate Level

None

3.1.3 High-Intermediate

- 2.2.1 Line continuation of numeric literals was not accepted.
- 2.2.2 Line continuation of certain COBOL words was not accepted.
- 2.2.3 An edited data item used as the receiving operand of a SUBTRACT statement gave incorrect results.

3.1.4 High Level

- 2.9.1 Improper execution of the OPEN appears to invalidate all accesses by the READ and WRITE statements.

3.2 American National Standard COBOL

Full American National Standard COBOL consists of the entire set of language elements defined in the ANSI COBOL standard (refer to 1.7). It is also the equivalent of high level Federal Standard COBOL plus the Report Writer module. Therefore, this section lists only those discrepancies found while validating the Report Writer Module.

- 2.13.1 The Report Writer Module programs were not run for this validation.

SECTION 4 SOFTWARE ENVIRONMENT.

The compiler referenced in this document was validated using the software environment described in this section. When using a modification of the described environment, the compiler may or may not continue to conform to the Standard. It should be noted that during the validation process, an attempt is made to validate as many different options as possible.

The use of compiler options, implementor-names in the Environment Division and any form of optimization which is not described in this report could cause the compiler to produce a program that does not perform according to the specifications of Standard COBOL. Only the environment described in this document has been used with this compiler to satisfy the requirements of FIPS PUB 21-1 and FPMR 101-32.1305.1a. (Any deviations which must be corrected as per the referenced FPMR are described in Sections 2 and 3 of this report.)

1. Options or parameters used on the processor call statement for the compiler: The following options/parameters were used during the validation.

Options specified:

(a) With no optimization invoked the compiler call statement was

```
//COMP EXEC PGM=IKFCBL00,REGION=128K,PARM="ADV,SIZE=16CK,
//           BUF=16K,TRUNC,LVL=D,APO,LAG,LIB"
```

(b) With optimization invoked the compiler call statement was

```
//COMP EXEC PGM=IKFCBL00,REGION=128K,PARM="ADV,SIZE=16CK,
//           BUF=16K,TRUNC,LVL=D,APO,LAG,LIB,OPTIMIZE"
```

Options defaulted:

NOPMAP	LINECNT=57	SPACE1
NOCLIST	FLAGE	SEQ
NOSUPMAP	SOURCE	NODMAP
NOXREF	NOSXREF	LOAD
NODECK	NOENDJOB	NOFLOW
NOTERM	NONUM	NOBATCH
NONAME	COMPILE=01	NOSTATE
NORESIDENT	NODYAM	NOSYNTAX
NOSYSMDMP	NOOPTIMIZE	NOTEST
VERB	ZWB	SYST
LVL=D	NOLIST	NOFDECK
NOCDECK	LCOL2	L120
NOCOUNT	ADV	NOPRINT
DUMP	NOVBSUP	NOVBREF
LANGLVL(2)		

The RES instead of the NORES and the DYNAM instead of the NODYAM options were specified for all Inter-program Communication audit routines.

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2. Environment Division implementor-names.

Printer destined files

S-SYSPRINT

The associated DD statement is
//SYSPRINT DD SYSOUT=A (for spooled files)
//SYSPRINT DD SYSOUT=010 (for nonspoiled files)

The latter statement was required for those programs using the LINAGE clause.

Tape files

S-TAPE1

An example of an associated DD statement is
//TAPE1 DD UNIT=16BPI,DSN=BT1,DCB=LEN=3

Sequential Mass-storage files

SEQMAS1

An example of an associated DD statement is
//SEQMAS1 DD UNIT=3330,SPACE=(TRK,(50,20)),DSN=88SQMAS1

Relative I-O files

RELMAS1

An example of an associated DD statement is
//RELMAS1 DD DSN=RELMAS1,DISP=SHR

Index I-O files

INXMAS1

An example of an associated DD statement is
//INXMAS1 DD DSN=SHR,AMP=AMORG

Sort files (SD)

SORT1

An example of an associated DD statement is
//SORT1 DD UNIT=3330,SPACE=(TRK,(50,20)),DSN=88SORT1

Switch names

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UPSI-1
UPSI-0

Source Computer names

IBM-370

Object Computer names

IBM-370

3. Optimization. The compiler may or may not have optimization features. If there was an optimization feature available, it was used during the validation process (during a separate execution of the Compiler Validation System) to determine if its use causes the compiler to produce a program which does not give the expected results. If the optimization is invoked through the compiler call statement then it is mentioned in paragraph 1 above. If it is invoked through the introduction of syntax in other than the Data and Procedure Divisions of the source program it is shown below. Optimization which would require modification to the Data and Procedure Divisions is not considered in this report in that it is beyond the scope of the use of standard COBOL and the validation process.

The optimization feature for this compiler is invoked through the compiler call statement. See 1. above. There was no difference in the execution of the programs when the optimization feature was invoked.

4. Compiler.

IBM OS/VS COBOL RELEASE 2.0 MOD 0

5. Operating system.

MVS 3.7 VS2 with SUB

6. Computer System Reference Manuals.

(a). IBM VS COBOL for OS/VS, Document No. GC 26-3857-0

(b). IBM OS/VS COBOL Compiler and Library Programmers Guide,
Document No. SC 28-6483-1.

SECTION 5. ASCII VALIDATION

5.1 Purpose of ASCII Validation

The ASCII Validation is performed by running a sequence of three CCOVS74 programs (SG118, SG119, SG120) using special procedures. The purpose of this special run is to validate that the compiler/operating system being tested is capable of processing ASCII code represented on magnetic tape and punched cards that were produced (in accordance with the appropriate American National Standard) by another system. There is also a magnetic tape and a card file created during the validation which will be taken to another system for further processing. The purpose is to determine whether the compiler/operating system being tested can also produce ASCII representation on magnetic tape and punched cards which can be processed by another computer system.

5.2 Applicable ANSI Standards

The ASCII Validation is based on several American National Standards and presumes their support by the compiler/operating system being validated. These are:

1. American National Standard Programming Language COBOL X3.23-1974
 - The CODE-SET clause is used to read and write the ASCII files.
 - The PROGRAM COLLATING SEQUENCE clause is used to process the data in ASCII mode as well as native mode.
 - The SIGN...SEPARATE clause is used for signed data and all data is in the DISPLAY (character) mode.
2. American National Standard Code for Information Interchange (ASCII) X3.4-1968. (Note that this describes the codes, not the labeling and tape recording formats.)
3. American National Standard Hollerith Punched Card Codes, X3.26-1970.
4. American National Standard Magnetic Tape Labels for Information Interchange, X3.27-1969.
5. American National Standard Recorded Magnetic Tape for Information Interchange (800 CPI, NZRI), X3.22-1967.
6. American National Standard Recorded Magnetic Tape for Information Interchange (1600 CPI, PR), X3.39-1973.

The language of the 1974 COBOL Standard provides the capability to accept, process, and produce ASCII code. The ASCII Standard describes the code insofar as the bit arrangement and configurations, but does not address recording tech-

niques, record formats or any labeling scheme. The 800 CPI, NZRI magnetic tape recording standard was used to establish the recording density and techniques. (1600 CPI, PE based on X3.39-1973 "Recorded Magnetic Tape for Information Interchange" could be used under special arrangements.) The tape labeling scheme used in these tests is based on X3.27-1969 but is also compatible with the revision to that tape label standard. Only the VOL1, HDR1, and ECF1 labels are used. The records are fixed length and unblocked.

5.3 ASCII Validation Process

During the validation, the Validation Manager for the Federal COBOL Compiler Testing Service uses the ASCII-encoded magnetic tape and card files in addition to the normal tape files associated with a validation. For the ASCII portion of the validation the following steps are performed:

1. The tape file and card deck (produced on another computer system) are used as input to several programs designed to validate whether the system being validated can accept and process the data as defined by the respective standards. Any changes made during this validation to the source programs reading the data are noted below in 5.4.1.
2. A tape file and card file are produced during the validation which should prove to be identical to the files described in 1 above. These two files are then processed on a different computer system to determine the degree to which the system being validated supports the ASCII standard. Any changes made during this validation to the source program producing the data are noted below in 5.4.2.

5.4 Results for This Validation

1. The system did not have a card punch or card reader for processing the ASCII-encoded punched cards and therefore, ASCII code represented on punched cards could not be validated. For this validation the data intended for these devices had to be placed on magnetic tape in order to execute Audit Routines SG118, SG119 and SG120.
2. Both the ASCII-encoded magnetic tape produced by a foreign system and the tape produced as a result of the validation were unlabeled for this validation. The recording format of the magnetic tape produced during the test was that corresponding to American National Standard Recorded Magnetic Tape for Information Interchange (1600 CPI, PE) X3.22-1973. A separate job was used to place the tape in 800 CPI for testing the tape on another computer system. The ASCII-encoded magnetic tape which resulted was read by the foreign computer system and proved to be correct in both content and format.

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APPENDIX A

VALIDATION SUMMARY WORKING DOCUMENT

A-1 This appendix is a working paper produced during the validation and documents the results of the compilation and execution of each of the programs comprising the C CVS. The results contained herein are based on the use of the compiler within the Validation Environment identified in this appendix. This appendix (Validation Summary Working Document) is not part of the official Validation Summary Report (VSR) and is not intended to reflect in any way the compiler's usefulness or degree of conformance to the language specifications.

The reader of this appendix should keep in mind that the same problem area may appear in more than one program, but is considered only as one single discrepancy and as such is reflected only once in the body of the VSR. (The VSR will in turn only reference the first occurrence of the problem in the appendix.)

This appendix is divided into two parts. The first part describes the Validation Environment. The second part of the document is divided into categories of information: compilation and execution results.

The reference document for COBOL is FIPS PUB 21-1 (X3.23-1974).

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VALIDATION ENVIRONMENT

COMPILER IDENTIFICATION: IBM OS/VIS COBOL Release 2.0 Mod 0
COMPUTER SYSTEM: IBM 370/158
OPERATING SYSTEM: MVS 3.7 VS2 with SUB

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ASVF9

The compiler flagged the VALUE clause on a Data Division entry, whose category was alphanumeric edited, with the following messages:

IKF2129I-C VALUE CLAUSE LITERAL DOES NOT CONFORM TO PICTURE.
CHANCE TO ZERO.
IKF2130I-E ITEM CANNOT HAVE VALUE CLAUSE. CLAUSE IGNORED.

The Data Division entry was

02 D-DATE PIC XXBXXBXXBXXBXX VALUE SPACE.

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DEBUG MODULE LEVEL 1

DB101 through DB105

A. Compilation

No errors.

B. Execution

No errors.

DEBUG MODULE LEVEL 2

DB201 through DB204

A. Compilation

No errors.

B. Execution

No errors.

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INDEX I-C MODULE LEVEL 1

IX101 through IX107

A. Compilation

No errors.

B. Execution

No errors.

INDEX I-C MODULE LEVEL 2

IX201 through IX204

A. Compilation

No errors.

B. Execution

No errors.

IX205

A. Compilation

No errors.

B. Execution

1. In test INX-TEST-001 a READ IX-FD1 .. INVALID KEY ... statement (random read) is used to access a file in the DYNAMIC ACCESS mode. The INVALID KEY path was taken on each execution of the READ statement.
2. INX-TEST-002 is to create an INDEX I-O file of 200 records under Dynamic Access mode and then read the file both randomly and sequentially. The INVALID KEY path appeared to be taken on the first execution of the WRITE statement.
3. INX-TEST-003.02 and INX-TEST-003.03 failed; however, these two tests depend on the file produced in INX-TEST-002. The failure of these two tests appears to be a result of B.2 above.

The above three errors appear to be caused by the improper execution of the OPEN statement for the data files by the VSAM file facility thus invalidating all accesses to the file.

IX206

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A. Compilation

No errors.

B. Execution

This program is similar to IX205 and produced the same type of failures as described in B.1, B.2, and B.3 above.

IX207 through IX208

A. Compilation

No errors.

B. Execution

No errors.

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INTER-PROGRAM COMMUNICATION MODULE LEVEL 1

IC101 through IC115

A. Compilation

No errors.

B. Execution

No errors.

IC151 through IC152

A. Compilation

No errors.

B. Execution

No errors.

INTER-PROGRAM COMMUNICATION MODULE LEVEL 2

IC201 through IC208

A. Compilation

No errors.

B. Execution

No errors.

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LIBRARY MODULE LEVEL 1

LB101 through LB107

A. Compilation

No errors.

B. Execution

No errors.

LIBRARY MODULE LEVEL 2

LB201 through LB207

A. Compilation

No errors.

B. Execution

No errors.

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NUCLEUS MODULE LEVEL 1

NC101 through NC104

A. Compilation

No errors.

B. Execution

No errors.

NC105

A. Compilation

No errors.

B. Execution

- MOVE-TEST-76 tests the move of a group data item to the alphanumeric edited data item with the picture character-string 0XXXXX0.

Computed result 0123AB0
Expected result 123AB

- In MOVE-TEST-92 a MOVE of a group data item to an alphanumeric edited data item did not produce the expected results.

Computed result: AB...XYZ +- =\$, .() / 0012345678
Expected result: AB...XYZ+- =\$, .() / 0123456789

NC106 through NC112

A. Compilation

No errors.

B. Execution

No errors.

NC113

A. Compilation

The compiler produced the message

IKF1083I-C ILLEGAL CHARACTER. SCAN RESUMED AT NEXT VALID CHARACTER.

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on the following COBOL code

003000 WORKING-
003100- STORAGE
003200 SECTION.

B. Execution

No errors.

NC114 through NC120

A. Compilation

No errors.

B. Execution

No errors.

NC151 through NC156

A. Compilation

No errors.

B. Execution

No errors.

NC157

A. Compilation

The compiler flagged a SYNCHRONIZED clause in an 01 level Data Division entry, which was an elementary data item, as an extension to all levels of Federal Standard COBOL.

B. Execution

No errors.

NC158 through NC162

A. Compilation

No errors.

B. Execution

No errors.

NC163

A. Compilation

The compiler flagged a SYNCHRONIZED clause in a 01 Level Data Division entry, which was an elementary data item, as an extension to all levels of Federal Standard COBOL.

B. Execution

1. In MOVE-TEST-76 a MOVE statement which moved a group data item to an alphanumeric edited data item did not produce the expected results. The results produced by this test were the same as NC105 B.1 above.
2. In MOVE-TEST-92 a MOVE statement which moved a group data item to an edited data item did not produce the expected results. The results produced by this test were the same as NC105 B.2 above.

NC164 through NC165

A. Compilation

No errors.

B. Execution

No errors.

NUCLEUS MODULE LEVEL 2

NC201

A. Compilation

The compiler incorrectly flagged the statement PERFORM ... VARYING ... FROM -5.5 BY ... UNTIL with the following message:

IKF8002I-W USE OF NEGATIVE INDEXES IN PERFORM STATEMENT IS AN EXTENSION TO ALL LEVELS.

There were no indices associated with the statement.

B. Execution

No errors.

NC202 through NC204

A. Compilation

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No errors.

B. Execution

No errors.

NC205

A. Compilation

1. The compiler issued three E-level and one C-level messages on statements which used line continuation for numeric literals. The statement constructs which caused the messages to be produced were:

```
035900 CONTIN-TEST-1.  
036000 MOVE 4  
036100- 5  
036200- 6  
036300- 7  
036400- 8 TO CONT-B.  
.  
.
```

```
037900 CONTIN-TEST-2.  
038000 MOVE -  
038100- 9  
038200- 9  
038300- 9  
038400- -  
038500- 7  
038600- 7  
038700- 7 TO CONT-B.
```

2. The compiler did not accept the following statement construct in CONT-TEST-4.

```
IF CONT EQUA  
- L TO ZERO  
- S AN  
- D GREATER  
- EQUAL TO CONT-C OR (((((0  
.  
.
```

(several blank source lines)

.

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```
- CON-D EQUAL TO COND-D 0
- R -11 + CONT-F ) ) ) ) )
- AND N
- OT NEGATIVE
- ZERO
- PERFORM PASS
EL
- SE
- PERFORM FAIL.
```

3. The compiler did not accept the following statement construct
in CONTIN-TEST-5.

```
DIV
- ID
- E CONT-F IN
- TO CONT-C GIV
- IN
- E CONT-D ROUN
- DE
- D
- O
- N SIZE ERR
- OR PERFOR
- M PASS G
- O T
- O CONTIN-WRITE-5.
```

B. Execution

Because of A. above, 4 tests were deleted.

NC206 through NC212

A. Compilation

No errors.

B. Execution

No errors.

NC213

A. Compilation

The compiler flagged Data Division entries which included a
VALUE clause with numeric-edited picture character-strings
as an extension to Federal Standard COBOL. The messages
produced were

IKF8002I-W NUMERIC LITERAL IN VALUE CLAUSE FOR NUMERIC

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EDITED ITEMS IS AN EXTENSION TO ALL LEVELS.

B. Execution

A numeric edited data item whose picture character-string was \$.* and was a receiving operand in a SUBTRACT statement did not give the expected results. The initial value of the data item was zero and the value resulting from execution of the statement was 9.99. Because the ON SIZE ERROR phrase was specified, the contents of the data-item was expected to be unaltered and contain its initial value of zero.

NC214 through NC218

A. Compilation

No errors.

B. Execution

No errors.

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RELATIVE I-C MODULE LEVEL 1

RL101 through RL109

A. Compilation

No errors.

B. Execution

No errors.

RELATIVE I-C MODULE LEVEL 2

RL201 through RL205

A. Compilation

No errors.

B. Execution

No errors.

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REPORT WRITER MODULE LEVEL 1

RW101 through RW104

The Report Writer Module programs were not run for this validation.

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SEGMENTATION MODULE LEVEL 1

SG101 through SG106

A. Compilation

No errors.

B. Execution

No errors.

SEGMENTATION MODULE LEVEL 2

SG201 through SG204

A. Compilation

No errors.

B. Execution

No errors.

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SEQUENTIAL ACCESS MODULE LEVEL 1

SQ101 through SQ117

A. Compilation

No errors.

B. Execution

No errors.

SQ118 through SQ120

A. Compilation

No errors.

B. Execution

The system does not support card punch or card reader devices for reading ASCII encoded punched cards. For these programs the files intended for use with the card reader and punch were assigned to magnetic tape instead.

SQ121

A. Compilation

No errors.

B. Execution

No errors.

SQ151 through SQ153

A. Compilation

No errors.

B. Execution

No errors.

SEQUENTIAL ACCESS MODULE LEVEL 2

SQ201 through SQ218

A. Compilation

No errors.

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B. Execution

No errors.

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SORT MODULE LEVEL 1

ST101 through ST117

A. Compilation

No errors.

B. Execution

No errors.

SORT MODULE LEVEL 2

ST201 through ST215

A. Compilation

No errors.

B. Execution

No errors.

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<p>16. Abstracts This Validation Summary Report (VSR) for the <u>IBM 370</u> COBOL Compiler Version 2 Mod 0 (<u>MVS</u> Version <u>3.7 VS2</u>) provides a consolidated summary of the results obtained from the validation of the subject compiler against the <u>1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1)</u>. The compiler was validated at the <u>High</u> level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed.</p>				
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TABLE HANDLING MODULE LEVEL 1

TH101 through TH111

A. Compilation

No errors.

B. Execution

No errors.

TH151 through TH152

A. Compilation

No errors.

B. Execution

No errors.

TABLE HANDLING MODULE LEVEL 2

TH201 through TH220

A. Compilation

No errors.

B. Execution

No errors.